Hazardous Waste Quantity Notification

Business Name Vicks Mfg. - Richardson-Vicks Inc.

Business Address 330 S. Warminster Road

Hatboro, PA 19040

EPA ID Number PAD-053283677

Hazardous Waste Generated

0 - 100 kg/month / /

100 - 1000 kg/month /X/

1000 kg/month or more / /

Rodger C. Bushnell 12-30-85

Signature and Title

Rodger C. Bushnell
Plant Engineer

EPA

Official Business
Penalty for Private Use
$300

FIRST-CLASS MAIL
POSTAGE & FEES PAID
EPA
PERMIT NO. G-35

United States
Environmental Protection
Agency

Washington DC 20460

JOHN A ARMSTEAD
VA/WV SECTION (3HW31)
US EPA REGIONIII
841 CHESTNUT ST.
PHILADELPHIA, PA 19107

EPA Form 5180-11 (5-79)

Please print or type with ELITE type *(12 characters/inch)* in the unshaded areas only.

Form Approved OMB No. 158-S79016
GSA No. 0246-EPA-OT

EPA U.S. ENVIRONMENTAL PROTECTION AGENCY

NOTIFICATION OF HAZARDOUS WASTE ACTIVITY

INSTRUCTIONS: If you received a preprinted label, affix it in the space at left. If any of the information on the label is incorrect, draw a line through it and supply the correct information in the appropriate section below. If the label is complete and correct, leave Items I, II, and III below blank. If you did not receive a preprinted label, complete all items. "Installation" means a single site where hazardous waste is generated, treated, stored and/or disposed of, or a transporter's principal place of business. Please refer to the INSTRUCTIONS FOR FILING NOTIFICATION before completing this form. The information requested herein is required by law *(Section 3010 of the Resource Conservation and Recovery Act).*

INSTALLATION'S EPA I.D. NO.	PAD053283677
I. NAME OF INSTALLATION	~~RICHARDSON MERRELL INC~~
II. INSTALLATION MAILING ADDRESS	330 SO WARMINSTER RD HATBORO, PA 19040
III. LOCATION OF INSTALLATION	330 SO WARMINSTER RD HATBORO, PA 19040

RECEIVED
EPA REGION III
AUG 1 1980 000308

DETACH

FOR OFFICIAL USE ONLY

COMMENTS: C

INSTALLATION'S EPA I.D. NUMBER: F PAD053283677 T/A 1 | APPROVED: | DATE RECEIVED (yr., mo., & day): 800818

I. NAME OF INSTALLATION

Vicks Health Care Division RMI

II. INSTALLATION MAILING ADDRESS

STREET OR P.O. BOX: ~~330 South Warminster Road~~

CITY OR TOWN: ~~Hatboro~~ | ST.: ~~PA~~ | ZIP CODE: ~~19040~~

III. LOCATION OF INSTALLATION

STREET OR ROUTE NUMBER: ~~330 South Warminster Road~~

CITY OR TOWN: ~~Hatboro~~ | ST.: PA | ZIP CODE: 19040

IV. INSTALLATION CONTACT

NAME AND TITLE *(last, first, & job title)*: Bushnell Rodger Plant Engineer | PHONE NO. *(area code & no.)*: 215-672-4000

V. OWNERSHIP

DETACH

A. NAME OF INSTALLATION'S LEGAL OWNER: ~~Richardson-Merrell Inc~~

B. TYPE OF OWNERSHIP *(enter the appropriate letter into box)*: M

F = FEDERAL
M = NON–FEDERAL

VI. TYPE OF HAZARDOUS WASTE ACTIVITY *(enter "X" in the appropriate box(es))*

- [X] A. GENERATION
- [X] B. TRANSPORTATION *(complete item VII)*
- [X] C. TREAT/STORE/DISPOSE
- [ ] D. UNDERGROUND INJECTION

deleted 2/9/11

VII. MODE OF TRANSPORTATION *(transporters only – enter "X" in the appropriate box(es))*

- [ ] A. AIR
- [ ] B. RAIL
- [X] C. HIGHWAY
- [ ] D. WATER
- [ ] E. OTHER *(specify)*:

deleted

VIII. FIRST OR SUBSEQUENT NOTIFICATION

Mark "X" in the appropriate box to indicate whether this is your installation's first notification of hazardous waste activity or a subsequent notification. If this is not your first notification, enter your Installation's EPA I.D. Number in the space provided below.

- [X] A. FIRST NOTIFICATION
- [ ] B. SUBSEQUENT NOTIFICATION *(complete item C)*

C. INSTALLATION'S EPA I.D. NO.:

IX. DESCRIPTION OF HAZARDOUS WASTES

Please go to the reverse of this form and provide the requested information.

CONTINUE ON REVERSE

I.D. – FOR OFFICIAL USE ONLY

W PAD053283677 | T/A C: 2 1

IX. DESCRIPTION OF HAZARDOUS WASTES *(continued from front)*

A. HAZARDOUS WASTES FROM NON–SPECIFIC SOURCES. Enter the four–digit number from 40 CFR Part 261.31 for each listed hazardous waste from non–specific sources your installation handles. Use additional sheets if necessary.

1	2	3	4	5	6
F001	F003				
7	**8**	**9**	**10**	**11**	**12**

B. HAZARDOUS WASTES FROM SPECIFIC SOURCES. Enter the four–digit number from 40 CFR Part 261.32 for each listed hazardous waste from specific industrial sources your installation handles. Use additional sheets if necessary.

13	14	15	16	17	18
19	**20**	**21**	**22**	**23**	**24**
25	**26**	**27**	**28**	**29**	**30**

C. COMMERCIAL CHEMICAL PRODUCT HAZARDOUS WASTES. Enter the four–digit number from 40 CFR Part 261.33 for each chemical substance your installation handles which may be a hazardous waste. Use additional sheets if necessary.

31	32	33	34	35	36
P100	U201	U202			
37	**38**	**39**	**40**	**41**	**42**
43	**44**	**45**	**46**	**47**	**48**

D. LISTED INFECTIOUS WASTES. Enter the four–digit number from 40 CFR Part 261.34 for each listed hazardous waste from hospitals, veterinary hospitals, medical and research laboratories your installation handles. Use additional sheets if necessary.

49	50	51	52	53	54

E. CHARACTERISTICS OF NON–LISTED HAZARDOUS WASTES. Mark "X" in the boxes corresponding to the characteristics of non–listed hazardous wastes your installation handles. *(See 40 CFR Parts 261.21 – 261.24.)*

- [X] 1. IGNITABLE (D001)
- [X] 2. CORROSIVE (D002)
- [X] 3. REACTIVE (D003)
- [X] 4. TOXIC (D000)

X. CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

SIGNATURE	NAME & OFFICIAL TITLE *(type or print)*	DATE SIGNED
[signature]	E. M. Pyatte Director of Operations	8/15/80

EPA Form 8700-12 (6-80) REVERSE

Vicks Toiletry Products Division • Vicks Health Care Division
RICHARDSON-VICKS INC.

May 11, 1981

Mrs. S. Bulkin
EPA Permit Enforcement Branch
3 EN 24 6th & Walnut
Philadelphia, PA 19106

Dear Mrs. Bulkin:

As per a telephone conversation of May 7, 1981 with your secretary Mrs. Baldino, the following letter references our Company name change.

On all EPA notification forms prior to March 10, 1981 our installation was listed as Vicks Health Care Division, Richardson-Merrell Inc. Due to the recent segregation of the Merrell Division, our new installation name is as follows:

(Vicks Health Care Division
Richardson-Vicks Inc.) ← Name change 6/15/81

As requested by your secretary, our EPA No. is PAD053283677.

Your cooperation in this matter is appreciated.

Sincerely,

VICKS HEALTH CARE DIVISION
RICHARDSON-VICKS INC.

William J. Mohan

W. J. Mohan
Project Engineer

Vicks Health Care Division
RICHARDSON-MERRELL INC.

P. O. BOX V
HATBORO, PA. 19040
TELEPHONE: (215) 672-4000

Revision

February 3, 1981

Mrs. S. Bulkin
EPA Permit Enforcement Branch
3 En24 6th & Walnut
Philadelphia, PA 19106

Dear Mrs. Bulkin,

Per our telephone conversation of Thursday, January 29, 1981, this letter references a notification of hazardous waste form that Vicks submitted to your office on August 15, 1980.

At the time of notification, due to uncertainty, Vicks listed itself as generators, transporters, and storers of hazardous waste. After a thorough investigation, Vicks has concluded that it only generates hazardous waste, therefore we wish to delete ourselves as transporters and storers of hazardous waste.

Your cooperation in this matter is appreciated.

delete TSD, Transportation, 2/9/81

Sincerely,

VICKS HEALTH CARE DIVISION
RICHARDSON-MERRELL INC.

William J. Mohan

W.J. Mohan
Project Engineer

cc: Mr. Galida, Department of Environmental Resources

Vicks Toiletry Products Division • Vicks Health Care Division
RICHARDSON-VICKS INC.

August 5, 1981

Mr. William Budd
Environmental Protection Agency
Hazardous Waste
6th & Walnut Sts.
Philadelphia, PA 19106

Dear Mr. Budd:

This letter will confirm our conversation on July 17, 1981. It is my understanding that we will be able to burn hazardous waste in our pyrolytic incinerator without being classified as a treatment/storage/disposal facility and without being required to have a permit to operate it. The reason is because the primary purpose of the incinerator is to produce energy (high pressure steam) through the recycling of our waste. Because of this criteria we are not subject to regulation under part 262 through 265. The specific special requirement is 261.6, Special Requirements for Hazardous Waste, which is used, reused, recycled or reclaimed.

(1) It is being beneficially used or reused or legitimately recycled or reclaimed (see attachment #1 of the federal register.)

Enclosed you will find subject matter pertaining to the pyrolytic incinerator, it should provide you with the necessary information about the hazardous waste disposal and liquid injection system. (see attachment #2)

Richardson-Vick also understands that we are considered a generator and must conform to certain regulations set down by the Environmental Protection Agency (EPA). They are:

(1) Richardson-Vicks is limited in burning 1000 kilograms per month of hazardous waste.
(2) That Richardson-Vicks storage time for hazardous waste could not exceed 90 days.
(3) Any other disposal of hazardous waste would have to comply with all EPA regulations.
(4) That any burning of hazardous waste would only be started after obtaining Air Quality and Solid Waste permits, from the Department of Environmental Resources.

P. O. BOX V, HATBORO, PA. 19040 TELEPHONE: (215) 672-4000

This letter should cover all the items discussed July 17. If you need any more information please feel free to contact me at 672-4000, ext. 242.

Sincerely,

Charles J. McGonigle

Charles J. McGonigle

cc: JWorth
DHower

ATTACHMENT 1
SMALL QUANTITY GENERATOR

in Subpart D is first added to the solid waste.

(3) In the case of any other waste (including a waste mixture), when the waste exhibits any of the characteristics identified in Subpart C.

(c) Unless and until it meets the criteria of paragraph (d):

(1) A hazardous waste will remain a hazardous waste.

(2) Any solid waste generated from the treatment, storage or disposal of a hazardous waste, including any sludge, spill residue, ash, emission control dust or leachate (but not including precipitation run-off), is a hazardous waste.

(d) Any solid waste described in paragraph (c) of this section is not a hazardous waste if it meets the following criteria:

(1) In the case of any solid waste, it does not exhibit any of the characteristics of hazardous waste identified in Subpart C.

(2) In the case of a waste which is a listed waste under Subpart D, contains a waste listed under Subpart D or is derived from a waste listed in Subpart D, it also has been excluded from paragraph (c) under §§ 260.20 and 260.22 of this Chapter.

§ 261.4 Exclusions.

(a) *Materials which are not solid wastes.* The following materials are not solid wastes for the purpose of this Part:

(1) (i) Domestic sewage; and

(ii) Any mixture of domestic sewage and other wastes that passes through a sewer system to a publicly-owned treatment works for treatment. "Domestic sewage" means untreated sanitary wastes that pass through a sewer system.

(2) Industrial wastewater discharges that are point source discharges subject to regulation under Section 402 of the Clean Water Act, as amended.

[Comment: This exclusion applies only to the actual point source discharge. It does not exclude industrial wastewaters while they are being collected, stored or treated before discharge, nor does it exclude sludges that are generated by industrial wastewater treatment.]

(3) Irrigation return flows.

(4) Source, special nuclear or by-product material as defined by the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 *et seq.*

(5) Materials subjected to in-situ mining techniques which are not removed from the ground as part of the extraction process.

(b) *Solid wastes which are not hazardous wastes.* The following solid wastes are not hazardous wastes:

(1) Household waste, including household waste that has been collected, transported, stored, treated, disposed, recovered (e.g., refuse-derived fuel) or reused. "Household waste" means any waste material (including garbage, trash and sanitary wastes in septic tanks) derived from households (including single and multiple residences, hotels and motels.)

(2) Solid wastes generated by any of the following and which are returned to the soils as fertilizers:

(i) The growing and harvesting of agricultural crops.

(ii) The raising of animals, including animal manures.

(3) Mining overburden returned to the mine site.

(4) Fly ash waste, bottom ash waste, slag waste, and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels.

(5) Drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of crude oil, natural gas or geothermal energy.

§ 261.5 Special requirements for hazardous waste generated by small quantity generators.

(a) Except as otherwise provided in this section, if a person generates, in a calendar month, a total of less than 1000 kilograms of hazardous wastes, those wastes are not subject to regulation under Parts 262 through 265 and Parts 122 through 124 of this Chapter and the notification requirements of Section 3010 of RCRA.

(b) If a person whose waste has been excluded from regulation under paragraph (a) of this Section accumulates hazardous wastes in quantities greater than 1000 kilograms, those accumulated wastes are subject to regulation under Parts 262 through 265 and Parts 122 through 124 of this Chapter, and the notification requirements of Section 3010 of RCRA.

(c) If a person generates in a calendar month or accumulates at any time any of the following hazardous wastes in quantities greater than set forth below, those wastes are subject to regulation under Parts 262 through 265 and Parts 122 through 124 of this Chapter, and the notification requirements of Section 3010 of RCRA:

(1) One kilogram of any commercial product or manufacturing chemical intermediate having the generic name listed in § 261.33(e).

(2) One kilogram of any off-specification commercial chemical product or manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in § 261.33(e).

(3) Any containers identified in § 261.33(c) that are larger than 20 liters in capacity;

(4) 10 kilograms of inner liners from containers identified under § 261.33(c);

(5) 100 kilograms of any residue or contaminated soil, water or other debris resulting from the cleanup of a spill, into or on any land or water, of any commercial chemical product or manufacturing chemical intermediate having the generic name listed in § 261.33(e).

(d) In order for hazardous waste to be excluded from regulation under this section, the generator must comply with § 262.11 of this Chapter. He must also either treat or dispose of the waste in an on-site facility, or ensure delivery to an off-site treatment, storage or disposal facility, either of which is:

(1) Permitted by EPA under Part 122 of this Chapter, or by a State with a hazardous waste management program authorized under Part 123 of this Chapter;

(2) In interim status under Parts 122 and 265 of this Chapter; or,

(3) Permitted, licensed, or registered by a State to manage municipal or industrial solid waste.

(e) Hazardous waste subject to the reduced requirements of this section may be mixed with non-hazardous waste and remain subject to these reduced requirements even though the resultant mixture exceeds the quantity limitations identified in this section, unless the mixture meets any of the characteristics of hazardous waste identified in Subpart C.

§ 261.6 Special requirements for hazardous waste which is used, re-used, recycled or reclaimed.

(a) Except as otherwise provided in paragraph (b) of this section, a hazardous waste which meets either of the following criteria is not subject to regulation under Parts 262 through 265 or Parts 122 through 124 of this Chapter and is not subject to the notification requirements of Section 3010 of RCRA until such time as the Administrator promulgates regulations to the contrary:

(1) It is being beneficially used or re-used or legitimately recycled or reclaimed.

(2) It is being accumulated, stored or physically, chemically or biologically treated prior to beneficial use or re-use or legitimate recycling or reclamation.

(b) A hazardous waste which is a sludge, or which is listed in Subpart D, or which contains one or more hazardous wastes listed in Subpart D; and which is transported or stored prior

ATTACHMENT #2

Industrial Finishing

A Hitchcock Publication

Converting Hazardous Wastes to Energy

Reprinted from February 1981 issue of INDUSTRIAL FINISHING

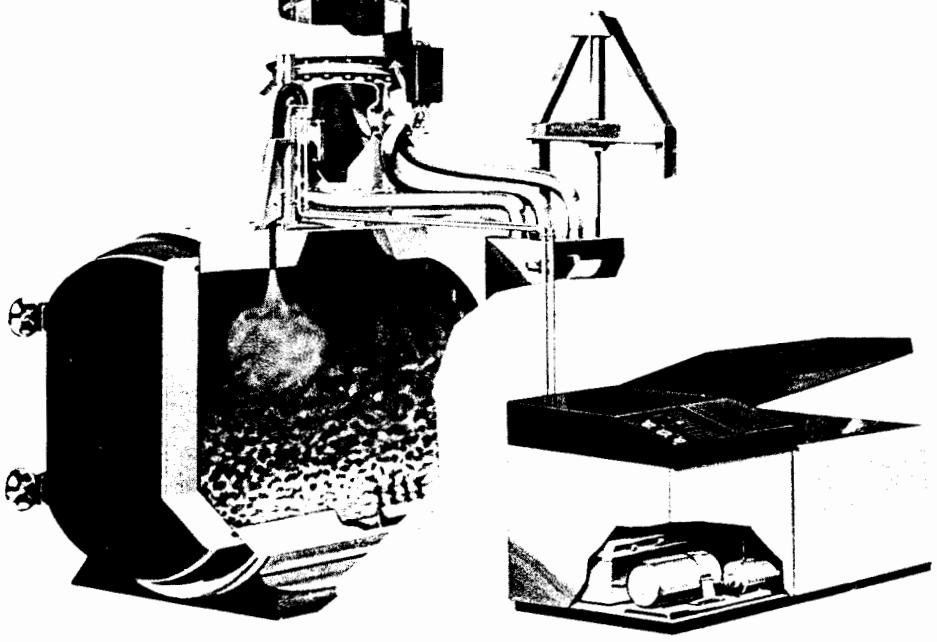
Converting Hazardous

Firing up a curing oven with the energy locked up in spent solvents and paint sludge is no longer an impossible dream. Kelley Company's newly developed liquid waste injection system now converts solvents, thinners, resins, paint sludges, hydraulic oils, machining lubricants and coolants from a plant's problem waste inventory into energy for process or comfort heating.

The injection system feeds combustible hazardous and non-hazardous liquids into a solid waste Kelley pyrolytic incinerator that combines with a steam or hot-water boiler for a complete waste-to-energy system. Recovery of the thermal output plus drastic cuts in hauling and disposal costs figure into the potentially rapid payback the Wisconsin company offers users.

"Payback," says Kelley President Robert C. Kuhns, "depends on Btu value of the waste. The energy value of a 55-gal drum of toluene, for instance, is equal to a 55-gal drum of No. 2 fuel oil. Waterbased coolants and paints, however, have a lesser value. But our system mixes solids and liquids to maintain the consistent thermal output needed for process heat and puts the user into the energy business."

James C. Kidd, manager of incinerator and energy products, reports that return on investment of the waste-to-energy system is higher than a new milling machine or paint booth.



Automatic, fully-modulated feed of combustible liquids from tank on right into pyrolytic chamber at left maintains consistent thermal output necessary to convert energy value of plant wastes into process heat.

The basic system

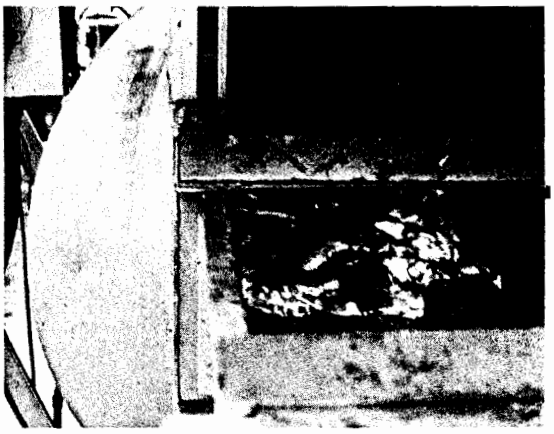
Pyrolysis is the chemical breakdown of material caused by heat. Kelley's waste-to-energy system is based on proven principles of pyrolysis, which has been successfully applied to solid wastes for 11 years.

The basic pyrolytic incinerator Kelley introduced in 1970 consists of a hydraulically powered feeder, a refractory-lined pyrolysis chamber, thermal reactor and stack. The operator loads wet or dry solid waste into the feeder hopper. When the hopper door is closed, a vertical charging door opens automatically and a hydraulic ram pushes the load into the chamber.

Air supply to the chamber is controlled at 30% of the stoichiometric requirement for complete combustion. The oxygen-lean atmosphere at chamber temperatures ranging from 649 to 982C (1200 to 1800F) thermally degrades wastes which give off combustible gases. There is little overfire turbulence.

Gases and extremely fine particulates flow to the thermal reactor

Wastes to Energy



Heat in oxygen lean atmosphere of pyrolytic chamber (above) degrades waste into combustible gases which are completely burned out in thermal reactor. Paint sludge that Chief Engineer Erlandsson (left) is stirring and filters (below) from dry spray booth provided a clean burn in special demonstration for IF reporters.

where they are ignited at temperatures ranging from 982 to 1093C (1800 to 2000F). Instantaneous air adjustment provides the perfect air to fuel ratio for a clean burn. Resulting flue gas consists mainly of harmless carbon dioxide and water vapor. Properly loaded and operated, the system meets all air pollution codes without any additional control-devices.

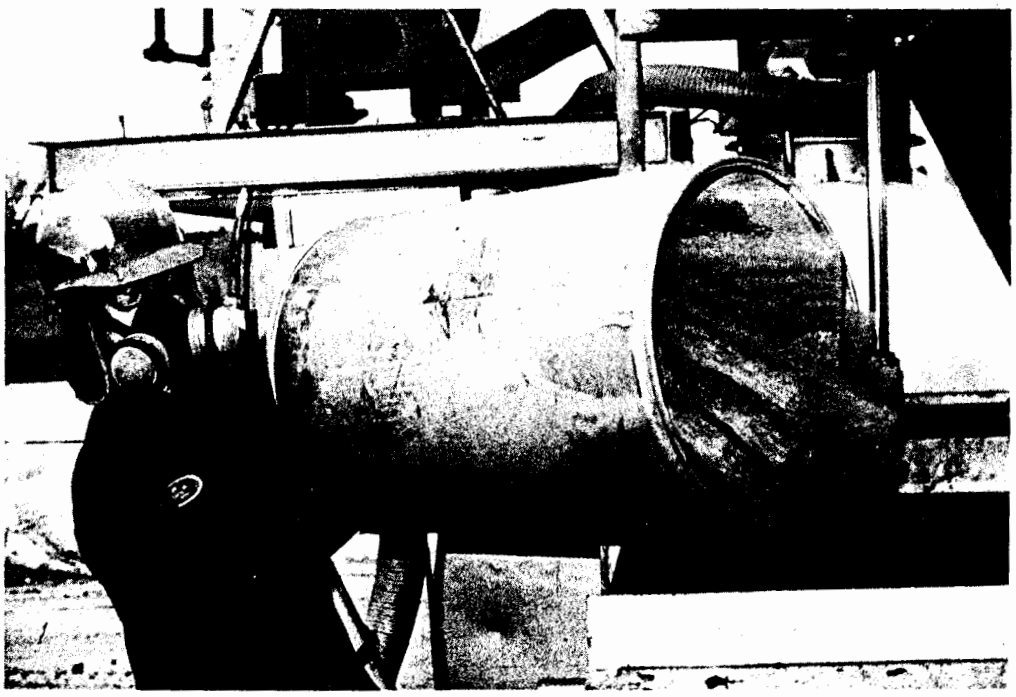
Liquid injection

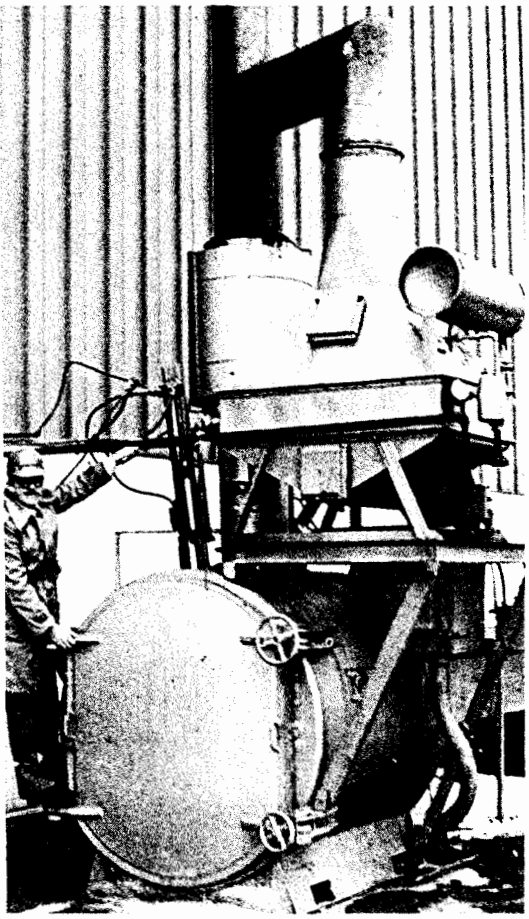
The automatically controlled liquid waste system, introduced in December 1980 feeds liquids into the pyrolytic chamber at the same time solid waste is being destroyed. The system consists of three assemblies: tank and flow control unit, injector and control box. Level switches in the 454-L (120-gal) tank control both the feed pump and a transfer pump if liquids are to be automatically supplied to the system.

Liquid feed starts after exhaust from the pyrolytic chamber reaches 704C (1300F), either from a solid waste charge or the chamber burner. Feed rate is fully modulated at two set points and controlled by the incinerator exhaust temperature.

At the upper set point, the feed rate decreases on temperature rise when burning liquids with high Btu values. The lower set point comes into action when feeding liquids with low Btu values, such as water-based liquids that drive down exhaust temperatures. Feed rate decreases on temperature drop to maintain combustion temperatures and achieve complete burnout.

Compressed air atomizes the liquids injected into the upper portion of the pyrolysis chamber. Liquid evaporates above the solid waste firebed. Vapors flow to the thermal reactor where they are ignited and





Erlandsson points out pneumatically operated injection mechanism that sprays liquids into pyrolytic chamber. Heat evaporates liquids; fumes are burned off in thermal reactor.

complete burnout is achieved. Low velocities and turbulence levels in the chamber allow heavy particles to fall by gravity into the pyrolysis chamber firebed.

The injector assembly is pneumatically extended into or retracted from the chamber. It automatically retracts when pumps are off to protect the nozzle from heat. A cam-actuated cap covers the injection port when the nozzle is retracted.

Atomizing air and liquid is mixed outside the 0.8-cm (5/16-in.) nozzle tip. Liquid breakup is accomplished by four air jets directed toward the liquid stream as it leaves the nozzle at 34 to 104 kPa (5 to 15 psi).

The central control panel is independent from the incinerator and feeder. The only connection with the incinerator is the charge door limit switch which prevents liquid feed and a possible flashback when the door is open. Other necessary interface controls are provided by temperature sensors in the pyrolysis chamber and the incinerator exhaust.

Applications and limitations

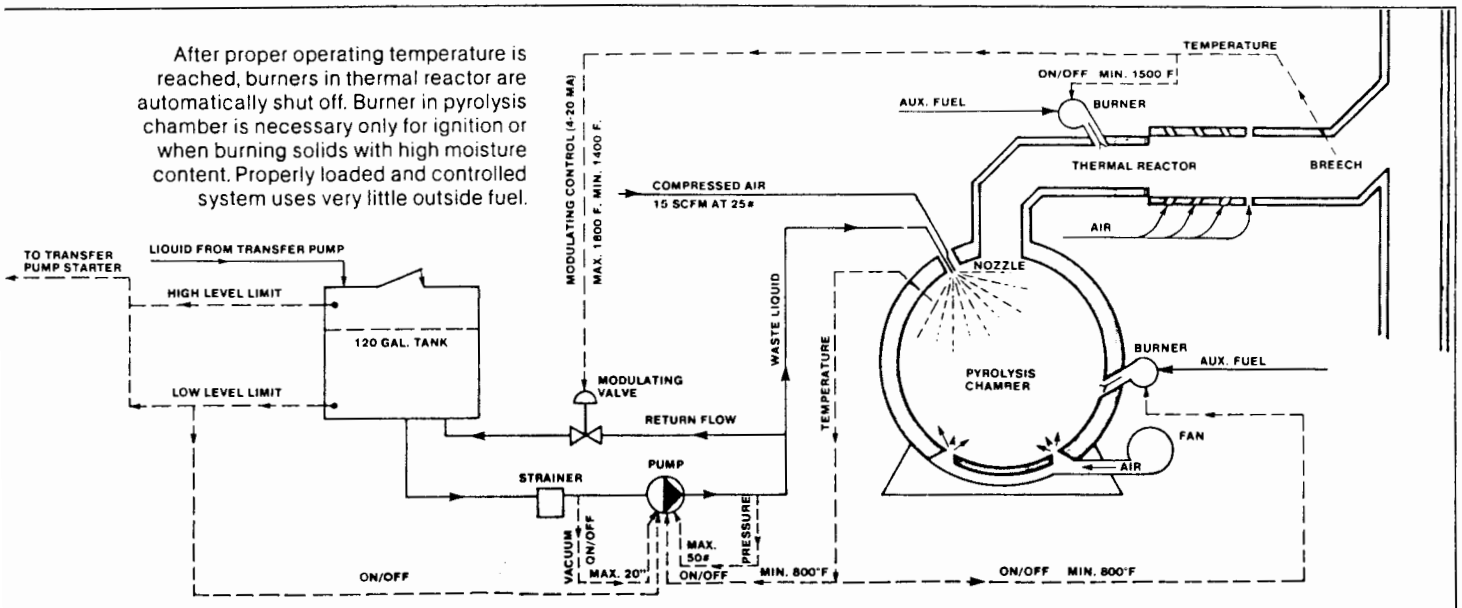
The Kelley system operates on any carbonaceous material, either in solid or liquid form. According to Kjell I. Erlandsson, chief engineer and designer, the system is ideally suited for pallets, paper, cardboard, non-chlorinated plastics and petrochemicals and paints with organic pigments. It is not designed to handle toxic chlorinated solvents or plastics, sulfur and materials such as lead- or zinc-based paints. Feed rates on other inorganically pigmented paints must be carefully controlled.

The only working model of a Kelley pyrolytic incinerator with the brand new liquid injection system is in operation at the company's Milwaukee plant. During the special demonstration conducted for IF reporters, Kelley personnel were feeding cardboard and paint-laden filters from the plant's dry spray booth into the hopper. Liquid feeds included toluene, waterborne paint sludge and miscellaneous oils and coolants. It was a clean burn.

Erlandsson adds that the system works at peak efficiency when thermal output is breeched to a fire tube boiler to generate steam. At least one customer, an Illinois manufacturer of heavy equipment, has been heating his paint curing oven with steam generated by a Kelley incinerator (without liquid injection) for several years. Retrofitting a bake oven with steam coils, according to Erlandsson, is not difficult.

Minimum size requires the equivalent, in solids and liquids, of one ton of trash a day. Each system is custom engineered from standard modules and based on a careful analysis of the user's wastes and installation configuration.

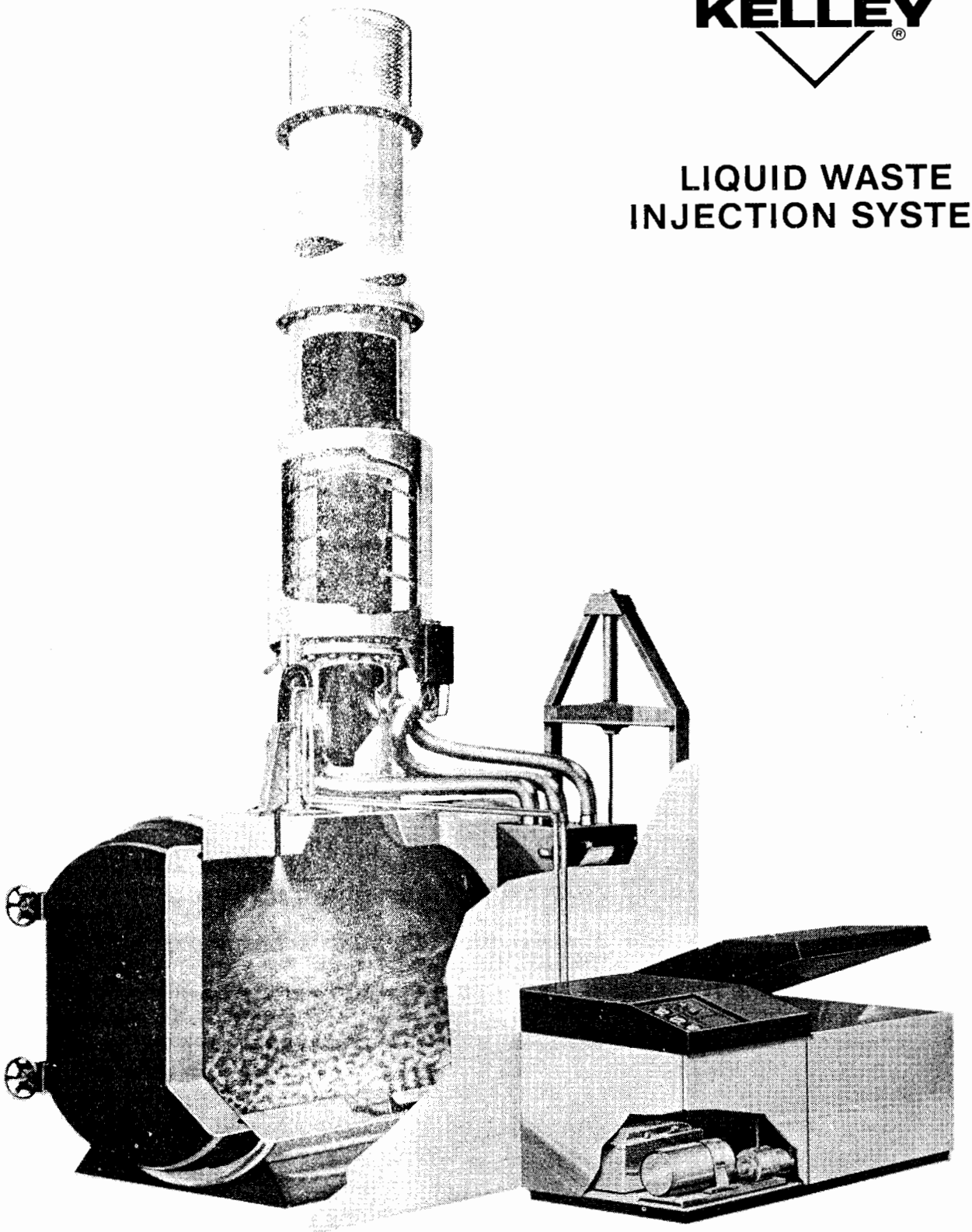
After proper operating temperature is reached, burners in thermal reactor are automatically shut off. Burner in pyrolysis chamber is necessary only for ignition or when burning solids with high moisture content. Properly loaded and controlled system uses very little outside fuel.



ATTACHMENT #2

KELLEY®

LIQUID WASTE INJECTION SYSTEM



KELLEY COMPANY, INC. • 6720 NORTH TEUTONIA AVENUE • MILWAUKEE, WISCONSIN 53209 • (414) 352-1000 • TELEX 26-661

INFORMATION NEEDED FOR LIQUID WASTE APPLICATIONS

1. Quantity of liquids
2. Mixture of chemical compounds
   - Type of compounds, e.g. Toluol, crankcase oil, alcohol, etc.
   - Percentage of each compound. If varying, give ranges.
3. Solid particle content
   - maximum particle size
4. Chemical analysis
   - Halogens, i.e. chlorine, iodine or bromine content
   - Sulphur content
   - Heavy metals, e.g. lead, mercury, cobalt, cadmium
5. Combustion analysis
   - Higher heating value (BTU value)
   - Ash content
6. Physical characteristics
   - specific gravity
   - viscosity

KELLEY LIQUID WASTE INJECTION SYSTEM

SYSTEM DESIGN

The Kelley Liquid Waste System is designed for use with the Kelley Pyrolytic Incinerator. It is automatically controlled and allows disposal of liquids at the same time as solid waste is disposed of. The system can handle liquid wastes commonly generated by industrial plants and hospitals.

The system consists of three assemblies; tank and flow control unit, injector and control box.

Installation requires that the control box be wired to a junction box on the tank and flow control unit and to the injector, and that pipe connection be made between the tank and flow control unit and the liquid injector.

The liquid feed rate is fully modulated and controlled by the incinerator exhaust temperature. It modulates at two temperature set points, upper and lower set point.

At the upper set point, the feed rate decreases on temperature rise. This action occurs when burning liquids with high BTU values, which drive up the exhaust temperature and thus the exhaust temperature is limited to a pre-set limit. The lower set point comes into action when feeding liquids with low BTU values, such as water based liquids, which drive down the exhaust temperature.

At the lower set point, the feed rate decreases on temperature drop. The purpose of the low end modulation is to assure that

minimum conbustion temperatures are maintained in order to achieve complete burnout in the incinerator thermal reactor.

When the exhaust temperature stays between the upper and lower set point, full liquid feed rate is maintained.

Liquids are injected into the upper portion of the pyrolysis chamber. The liquid is atomized by compressed air in an atomizing nozzle. Compressed air is used for atomization in order to maintain atomization throughout the whole range of flows. The liquids evaporate above the solid waste firebed and then flow to the thermal reactor, where they are ignited and burnout is achieved.

If the liquid contains heavy particles, these will fall by gravity into the pyrolysis chamber firebed due to the low velocities and turbulence level in the pyrolysis chamber.

TANK AND FLOW CONTROL UNIT

The tank and flow control unit is prewired and pre-piped. It contains the pump, motorized flow control valve, manual valves, pressure and vacuum switches, liquid screen and a 120 gallon holding tank. These components are all enclosed in a steel cabinet with doors for easy service access.

The cabinet is equipped with a gauge panel for monitoring of liquid pressure and vacuum and also an atomizing air pressure gauge and regulator. An on/off switch permits start-up and shutdown of the system.

All wiring and electrical components in the tank and flow control unit are housed in enclosures designed to prevent explosion.

The tank is equipped with level switches for control of feed pump and also for a transfer pump if liquids are automatically supplied to the 120 gallon tank.

The pump suction line is connected at a point approximately 1/2" from the bottom of the tank in order to prevent the heavy solids from entering the system.

A drain valve is located at the bottom of the tank and this allows draining of the tank should large amounts of heavy solid accumulate at the bottom. There is a 12" by 12" opening on the top of the tank allowing manual dumping of liquids.

The system uses a fixed displacement feed pump, which assures that the feed rate is maintained even if pressures vary due to liquid viscosity, or by partial nozzle plugging.

Two styles of pumps are used, progressing cavity pump and gear pump. The progressing cavity pump uses a screw type rotor in an elastomer stator. Since the stator is flexible, this pump can handle liquids with solid particles. The stator is compatible with oil base liquids, alcohol, water base liquids and some solvents. It's not compatible with ether, lacquers or lacquer solvents, or ketones.

The gear pump is employed for liquids not compatible with the materials of the progressing cavity pump. The gear pump uses Teflon seals, which are chemically compatible with almost all liquids. However, the gear pump cannot handle liquids containing solid particles.

The gear pump is equipped with an internal relief valve, which limits the pipe pressure to 100 psi.

The pump draws the liquid from the tank through a 1-1/2" pipe. The flow velocity in the suction side is low, maximum ten feet per minute. The suction line is equipped with a strainer to protect the pump. It is also equipped with a vacuum switch, which will shut down the pump in case of excessive vacuum.

The pressure side of the pump is connected to the injector, which feeds the liquid into the incinerator, and also connected via a return line back to tank. A motorized metering valve in the return line controls the flow back to tank and thus the flow to the injector. The pressure side is equipped with a pressure unit switch in order to shut down the pump in case of line plugging.

The piping is supplied with manual valves to allow service to be performed without draining the entire system. The piping is also supplied with numerous pipe unions, again for easier servicing.

INJECTOR

The liquid injector assembly is extended into the pyrolysis chamber and retracted by a pneumatic cylinder. It is automatically retracted when the pumps are shut off in order to protect the nozzle from heat when no liquid is flowing. A cam actuated cap covers the injection port when the nozzle is retracted.

The nozzle uses compressed air to atomize the liquid. The liquid orifice is large, 5/16", in order to keep the nozzle tip from fouling or plugging when used with liquids containing solid particles. The design of the nozzle is such that the liquid flows straight through the center and thus reducing the opportunity for solids to accumulate.

The atomizing air and liquid is mixed outside the nozzle and the liquid breakup is accomplished by four air jets directed towards the liquid stream as it leaves the nozzle. The liquid leaves the nozzle at low pressure, 5-15 psi.

CONTROLS

The system is controlled from a central control panel, which is independent from the incinerator and feeder control panel. The only connection the liquid injection system control has with the incinerator control is the charge door limit switch. The other necessary interface controls are provided by temperature sensors located in the pyrolysis chamber and the incinerator exhaust.

The control panel is equipped with an on/off switch for manual shutoff and pilot lights indicating high vacuum or high pressure conditions.

There are three temperature controllers in the control panel. Two of these are proportional, i.e. modulating, controllers and one is an on/off controller. All the temperature controllers are designed such that if they fail, they are designed to fail in a safe mode.

The modulating controllers sense the exhaust temperature and control the motorized valve in the liquid return line. One controls the upper modulation set point, and the other the lower modulation set point. The upper modulation set point controller has an auxiliary set point, which switches the temperature control function over to the lower set point controller at a temperature approximately half way between the upper and lower modulation set points.

The control action of the modulating controllers is such that when a decreased liquid feed rate is called for by the exhaust temperature,

the motorized valve opens and thus more liquid is returned to the tank, leaving less for the nozzle.

A limit switch operated by a cam on a slip clutch arrangement is mounted on the flow control modulating motor. This limit switch senses the rotational direction of the modulating motor and is connected to an adjustable repeat timer. This timer makes it possible to control the time required to close the modulating valve and can be adjusted such that it takes up to one full hour to increase the liquid feed rate from 0% to 100%. This timer eliminates the risk of the exhaust temperature overshooting its set limit due to time lags in the combustion system.

When the modulating valve opens, i.e. decreases the feed rate, the limit switch bypasses the timer and the feed rate will decrease from 100% to 0% in 50 seconds. This is done so that the system can react quickly if there is a combustion surge from solid waste being charged.

The pump is interlocked with the main chamber temperature by the on/off controller.

A time delay relay allows the valve to return to its open position at start-up so that lightoff will take place at a low liquid feed rate.

The pump is interlocked with the vertical charge door of the solid waste feeder on the incinerator so that no liquid will flow during the feed cycles.

A time delay is incorporated for the pneumatic cylinder air valve so that when the pumps shut down, the nozzle will stay extended for a short period of time in order to let the injector drain into the pyrolysis chamber rather than on the outside of the pyrolysis chamber.

The injector is equipped with a limit switch, which keeps the pump and atomizing air from activating until the injector is extended, again to prevent liquids from draining on the pyrolysis chamber.

The tank assembly includes three ultrasonic type liquid level controllers, one low level controller and two high level controllers. In case of low liquid level in the tank, the system will automatically shut down and the nozzle will be retracted. The same action will automatically be taken, if the vacuum on the pump suction or pressure on pump discharge side exceeds its limits, which are factory preset.

The high level controllers will operate a transfer pump supplying liquids to the tank/flow control unit. One normally controls the pump and the other one is a safety back-up controller designed to prevent tank overflow in case of failure of the normal controller.

SEQUENCE OF OPERATION

The operation of the Liquid Feed System is automatic.

In order to start the Liquid Feed System, the pyrolysis chamber of the incinerator has to be preheated. This is generally done by loading of the solid waste, but can also be done by preheat with the burner.

When the pyrolysis chamber reaches 800°F., the system is activated. A time delay permits the control valve to move to its fully open position to prepare the system for low-fire start. When the exhaust temperature from the solid waste reaches 1300°F, the valve on the pump return line starts to close. An end switch on the modulating motor closes, the injection nozzle is extended and the pump starts.

Liquid is now being injected into the pyrolysis chamber. If it is a high BTU liquid, the exhaust temperature will rise, the valve will close further until maximum feed rate is achieved. The time for complete closure is adjustable up to one hour. If the temperature reaches 1600°F, the valve again starts opening and the feed rate is cut back. Thus, the valve controls the temperature so that it will stay at the set point.

If solid waste is charged at this point, the exhaust temperature will rise further, and the modulating valve will cut back on the liquid feed rate.

The temperature controlled valve is designed to prevent the exhaust temperature from exceeding the incinerator design temperatures, which in turn are related to the heat release. As the heat release from the solid waste tapers off, the exhaust temperature drops and the liquid feed rate is increased. In essence, even exhaust temperatures are maintained as long as high BTU liquids are available.

When burning low BTU liquids, the liquid will cause the exhaust temperature to drop. When the temperature drops below 1500°F, the liquid flow rate will start to cut back to prevent further temperature decrease. This means that when burning low BTU liquids, solid waste in sufficient quantities must be available to maintain minimum combustion temperature or the liquid feeder will shut down.

Should at any time during liquid feed the pyrolysis chamber drop below 800°F, the pump will shut down and the nozzles will retract.

During the operation, whenever the exhaust temperature is outside the operating range, i.e. not between upper and lower set point, the pump will shut down and the system be deactivated.

POWER/AIR REQUIREMENTS

The system operates on 110 volt single phase power. The maximum operating current is 10 amps.

Nozzle and pneumatic cylinder requires compressed air. Maximum consumption is 25 SCFM and maximum required pressure 40 psig.

APPLICATIONS

The Liquid Feed System is designed to handle most liquid wastes generated by industry. This includes cutting oils, lube oils, alcohols and solvents.

The liquid must be pumpable. For any liquids with a viscosity above 5,000 SSU, equivalent to No. 6 fuel oil or 30 weight lubricating oil, consult factory.

When liquids are part of the waste stream, the incinerator is sized in the same manner as when sizing for solid waste only, i.e. by BTU Value and lbs./hour.

BTU values for liquids are generally given in BTU's per gallon and amounts of liquids generated per day generally in gallons per day. To convert from BTU per gallon to BTU per lb., simply divide by the density of the liquid. When converting from gallons per day

to lbs. per day, multiply by the density. The density generally will fall between 7 and 9 lbs. per gallon.

In addition to liquid disposal during the regular solid waste feeding hours, it's possible to dispose of liquids during the burndown. The thermal capacity of the incinerator and the BTU value of the liquids then determines the amount of liquids that can be disposed of during burndown.

When disposing of high BTU liquids, the burning rate will equal the feed rate, as opposed to when burning solids in which case the feed rate is higher than the actual burning rate. Accordingly, the following guidelines should be used for sizing liquid waste comsumption during periods when only liquids are disposed of.

Thermal Capacity: 2500, 14,000,000 BTU/hour
1280, 7,500,000 BTU/hour
780, 4,750,000 BTU/hour
380, 2,500,000 BTU/hour

In the initial phase of the burndown, some solids will be burned, generally during the first two hours. During this period the liquid feed rate will increase as the heat release from the solid waste decreases. For sizing purposes, the average liquid feed rate during this initial phase equals half of the thermal capacity of the incinerator model.

Example. Model 1280 disposing of liquids during burndown. How long will it take to dispose of 200 gallons of 125,000 BTU per gallon liquid.

Maximum liquid feed rate: 7,500,000 ÷ 125,000 = 60 gallons per hour.

Feed rate during initial burndown phase equals 30 gallons/hour.

Liquid disposed of during the first two burndown hours: 30 x 2 = 60 gallons.

Liquid left after initial burndown phase: 200 - 60 = 140 gallons.

Time to burn: 140 gallons = 140 ÷ 60 = 2.33 hours.

Total liquid burn time after beginning of burndown: 2 + 2.33 = 4.33 hours.

UNIQUE FEATURES

Several features on the liquid feeder are unique. The main feature is the modulated feed rate. It enables the user to use spare heat release capacity of the incinerator when the incinerator is charged at less than rated capacity such as during lunch hour and burndown. It also stabilizes the heat output of the incinerator, and if equipped with a boiler, the steam output.

The system is operated automatically, i.e. it automatically comes on and off without operator interference. This automatic control is also valuable in that liquid can be disposed of during periods when no full time operator is available.

The retractable nozzle is unique. The retracting feature extends the life of the nozzle and also reduces the possibility of plugging when burning liquids that can set up by heat.

The system is packaged in a standard configuration. The skid mounting simplifies the installation.

Fixed displacement pump with return valve modulating is also unique. It allows system pressure to vary when liquid viscocity varies without changing flow rate characteristics.

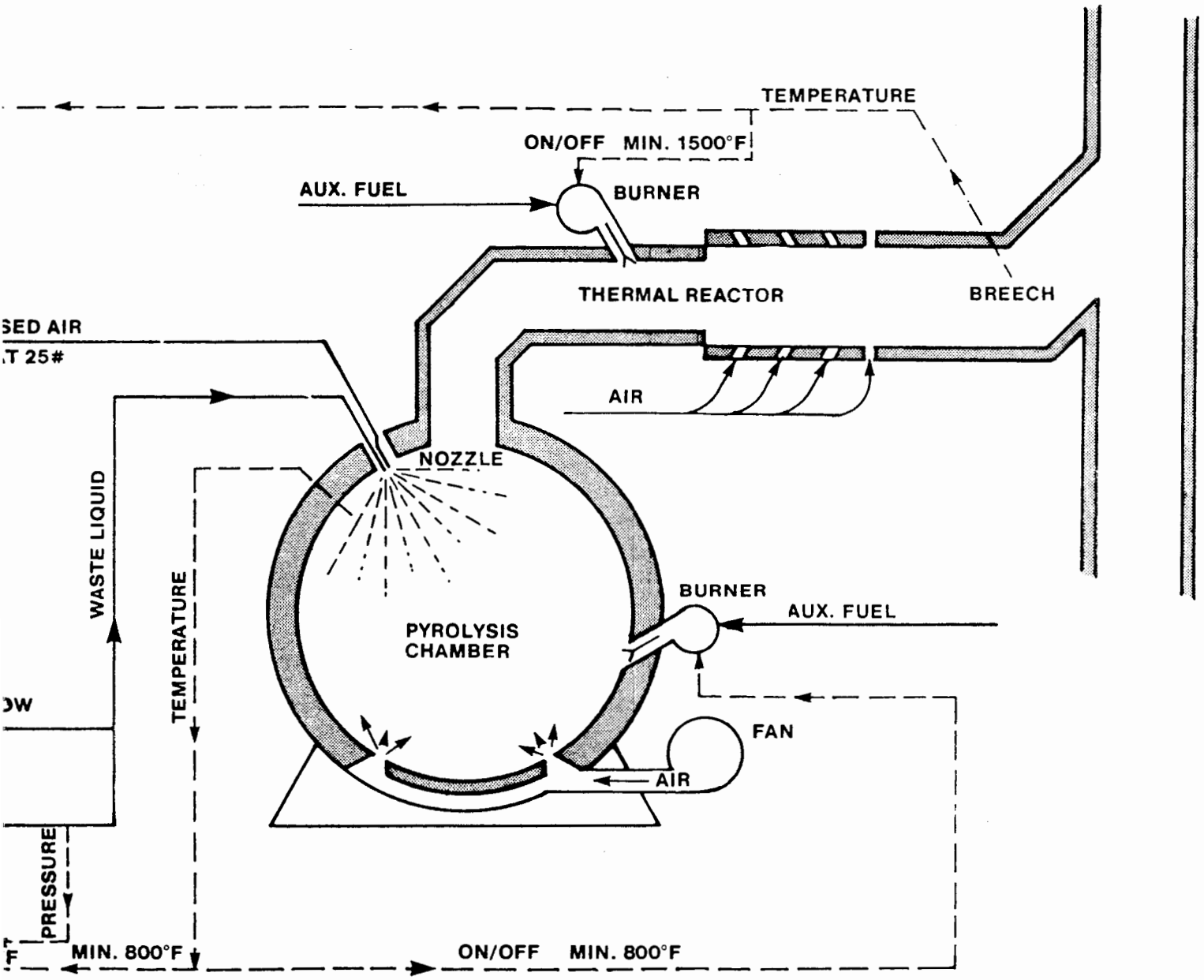
Injection assembly does not include a burner. Liquid is simply evaporated in the pyrolysis chamber and heavier particles contained in the liquid will drop down into the firebed. The nozzle has a large orifice and is of simple construction.

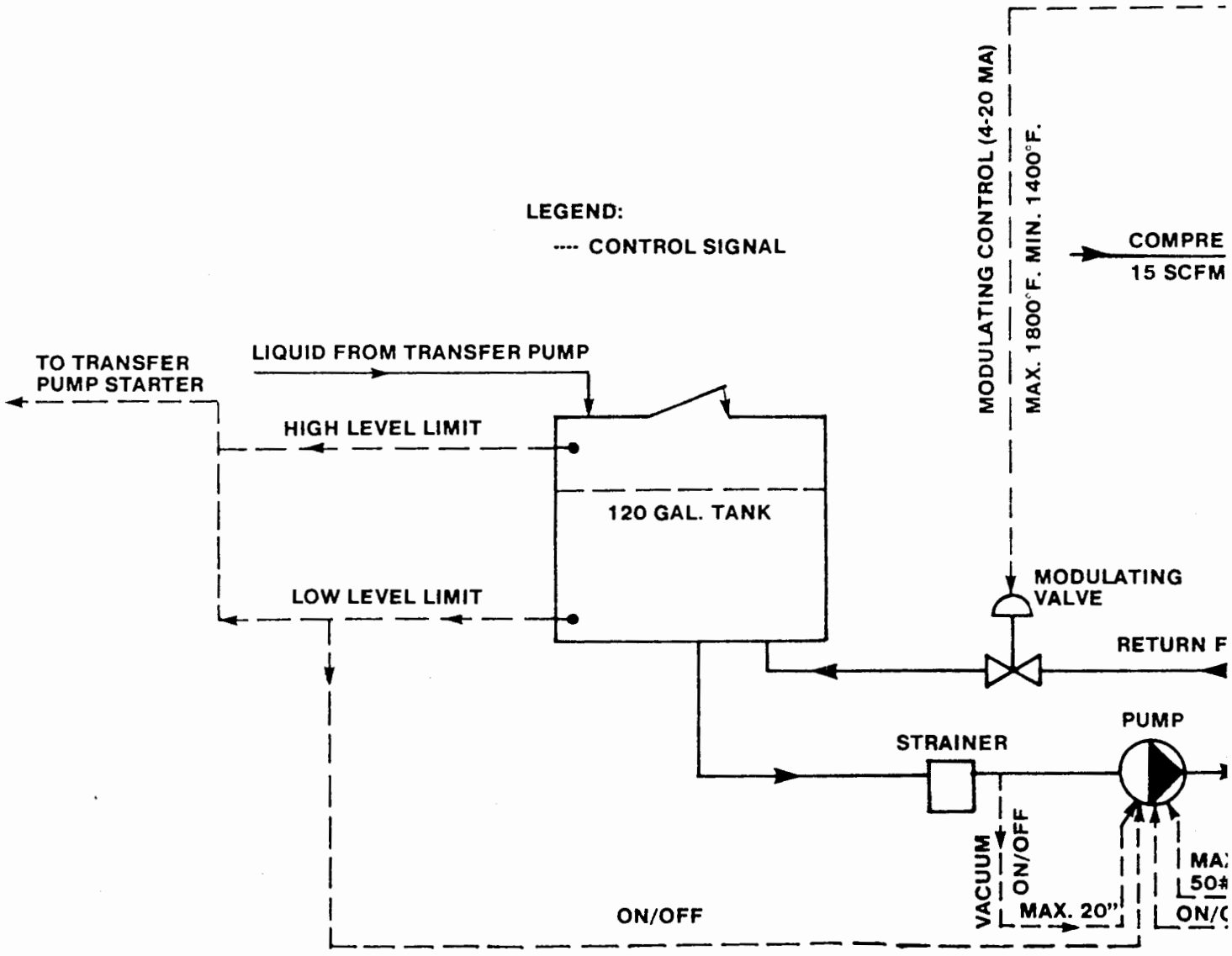
KELLEY®

LIQUID WASTE INJECTION SYSTEM

PATENT APPLIED FOR

FLOW DIAGRAM




LEGEND:
---- CONTROL SIGNAL
MODULATING CONTROL (4-20 MA)
MAX. 1800°F. MIN. 1400°F.
COMPRE
15 SCFM
TO TRANSFER
PUMP STARTER
LIQUID FROM TRANSFER PUMP
HIGH LEVEL LIMIT
120 GAL. TANK
LOW LEVEL LIMIT
MODULATING
VALVE
RETURN F
PUMP
STRAINER
VACUUM
ON/OFF
MAX. 20"
MA
50#
ON/C
ON/OFF